Amendments to the Specification

Please replace the following paragraphs:

Page 8, lines 20-25,

BRIEF DESCRIPTION OF THE DRAWINGS:

Figure 1A is a block diagram of a first embodiment of the invention;

~~Figure 1B is~~ Figures 1B-1 and 1B-2 comprise a block diagram of a second embodiment of the invention;

Figure 2 is a detail of a portion of the embodiment shown in Figure 1A;

Figures 3A and 3B together comprise a more detailed circuit block diagram of the first embodiment of the invention;

Page 9, lines 1-16,

~~Figure 4 is~~ Figures 4-1 through 4-6 comprise a schematic diagram showing circuitry for an interface module for the embodiment shown in ~~Figure 1B~~ Figures 1B-1 and 1B-2, providing breaker circuitry that monitors and controls water consumption in accordance with the invention;

~~Figure 5 shows~~ Figures 5-1 through 5-6 show the interface module motherboard including master-slave microcontrollers;

~~Figures 6A, B, C and D~~ Figures 6A-1 through 6A-8, 6B-1 through 6B-8, 6C-1 through 6C-8, and 6D-1 through 6D-8 show eight (8) additional slave microcontrollers provided on the motherboard of ~~Figure 5~~ Figures 5-1 through 5-6;

~~Figure 7 is~~ Figures 7-1 through 7-4 comprise a schematic diagram showing alarm enunciation devices used for indicating alarm conditions and the like;

~~Figures 8 and 9~~ Figures 8-1 and 8-2 and Figures 9-1 and 9-2 show power and battery backup circuitry, respectively, for the monitoring and controlling circuitry of the described system;

Figure 10 shows the interface module "breaker" housing for the ~~circuity~~ circuitry of ~~Figure 4~~ Figures 4-1 through 4-6, providing breaker circuitry that monitors and controls water consumption in accordance with the invention; and

Figure 11 shows the panel housing for the motherboard of ~~Figure 5~~ Figures 5-1 through 5-6 to receive a plurality of interface modules.

Page 9, lines 17-25,

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS:

Reference now should be made to the drawings, in which the same reference numbers are used throughout the different figures to designate the same or similar components. ~~Figures~~ Figure 1A and ~~B~~ Figures 1B-1 through 1B-2 are block diagrams of water monitoring systems providing comprehensive monitoring of various alarm conditions representative of malfunctioning parameters in water-based systems and the like. In addition, the system of Figure 1A operates in response to a water appliance or system malfunction to turn off the input water supply and to disconnect the energy source supplying heat to the water appliance or system when such a malfunction occurs.

Page 11, lines 1-13,

As indicated in Figure 1A, one of the parameter sensors is a water leak detector 32. This is indicated diagrammatically in ~~Figure 1~~ Figure 1A, with a pair of contacts shown located beneath the water tank 10. A suitable container (not shown) to catch water leaks from the water tank 10 and the pipes 12 and 24 may be provided. When the water level

becomes sufficient to bridge the contacts which are shown extending from the leak sensor 32, it provides a signal to the controller 30 indicative that a leak, either from the water tank 10 itself or from the supply pipe 12 or the water outlet pipe 24, in the vicinity of the hot water tank 10, has occurred. The signal sent to the controller 30 then is processed to place the system in its alarm and safety shut down mode. Also shown in ~~Figure 1~~ Figure 1A is a float sensor 34 to provide an indication that the water level within the tank 10 has dropped below a safe level. The output from the float sensor 34 is supplied to the controller 30 to cause it to operate in a manner similar to the response to the leak sensor 32.

Page 13, lines 17 and 18,

~~Figure 1B shows~~ Figures 1B-1 and 1B-2 show a second embodiment block diagram for monitoring and controlling water consumption in a water-based system.

Page 15, lines 20-25 through Page 16, lines 1-6,

Figures 3A and 3B are a diagrammatic circuit diagram of the microcontroller 30 and various other connections to that microcontroller for responding to the various sensed parameters which are shown in the block diagram of ~~Figure 1~~ Figure 1A. The microcontroller 30 is supplied with power from the power supply 52, as indicated previously. The power supply 52 includes some or all of the different voltages shown in Figure 3A, namely +12VDC, -12VDC, +3.3VDC, and +5VDC. These are typical operating voltages for various integrated circuits and are employed in a preferred embodiment of the invention to operate the different sensors 32, 34, 36 and 38, as well as other elements of the system. Some of these voltages are supplied through the microcontroller 30, and others are obtained directly from the power supply 52. The manner in which this is done is conventional, and for that reason, all of the various circuit interconnections have not been shown in Figures 3A/3B.

Page 16, lines 13-25 through Page 17, lines 1 and 2,

The sensor circuits 32, 34, 36B and 38B are illustrated diagrammatically in Figure 3B. All of these sensors include identical circuitry, operated in response to the respective sensed condition to supply an output signal to the controller 30. Consequently, it is possible to operate the system with a sensing of all of the various parameters which have been described in conjunction with ~~Figure 1~~ Figure 1A, or less than all of them. Whichever system is employed, however, the overall operation with respect to the manner in which the signal is supplied from the sensor to the controller 30 is the same. Each of the sensors 32, 34, 36B and 38B includes a circuit for sensing the interconnection of contacts, such as the contacts described above in conjunction with the leak sensor 32, or with the temperature activated switch 36A, or the power sensor element 38A to supply a signal to the integrated circuit sensor block 32, 34, 36B or 38B. If not all of the sensors shown in ~~Figure 1~~ Figure 1A are employed, the appropriate one or more of them may be eliminated. The operation of the remainder of the system, however, is unchanged from that described above.

Page 18, lines 10-25 through Page 19, lines 1-5,

The interface module system includes two basic circuit modules. The first module is referred to as the interface module or "breaker" as shown in ~~Figures 4~~ Figures 4-1 through 4-6 and Figure 10 discussed below. The interface module is designed to plug into the second module, an expansion board known as the interface module motherboard or circuit panel as shown in ~~Figures 5~~ Figures 5-1 through 5-6 and Figure 11 discussed below. The interface module circuitry is identical on both versions. The second embodiment of ~~Figure 1B~~ Figures 1B-1 and 1B-2 is accomplished using modular computer aided design (CAD) and modular computer aided manufacturing (CAM) design concepts. While the circuitry is identical, selective loading or placing of groups of parts (modules) on the printed circuit board (PCB)

varies from version to version during manufacturing. As an example, the stand-alone version includes a radio frequency transceiver allowing wireless communications with the interface module motherboard. It is included, or CADed in the design of the stand-alone version circuit board, but is not CADed (or added) on the plug-in version. The circuitry for the input sensor on both versions supports three different types of input sensors: 1) a 24vdc digital sensor 2) a 5vdc digital sensor 3) an analog input voltage sensor. Many types of sensors are supported including leak detectors, flow (volume) sensors, pressure sensors, ~~termpature~~ temperature sensor and level detectors. The color of interface modules molded housing reveals the functionality. While the PCB is the same for each, using modular CAM techniques, the circuitry for each type of input circuit is selectively loaded (installed or placed) on the circuit board as required for each interface module type.

Page 24, lines 11-22,

With reference to ~~Figure 4~~ Figures 4-1 through 4-6, the stand-alone interface module circuitry is based on a "state-of-the-art" microcontroller, such as a Cygnal Integrated Products C8051F310 device 111. The F310 is an 8-bit device with an 8051 family central processing unit (CPU) operating at 25mhz, requiring as little as one clock cycle per instruction and instruction cycle time of 40 nano seconds. This means the device is capable of executing a single instruction in 40nsec, or up to 25 million instruction per seconds (MIPS). Seventy percent of the instruction set operates with one clock cycle. The balance requires two, three, or four clock cycles. The device includes sixteen mega bytes of FLASH program memory for storing the control (application) program and non-volatile data and 1280 bytes of random access memory (RAM) for temporary data storage. A total of 29 Input/Output port pins are provided. That means up to 29 input and/or output signals can be connected to the device.

Page 26, lines 24 and 25 through Page 27, lines 1-12,

As shown in ~~Figure 5~~ Figures 5-1 through 5-6, the interface module motherboard is a very high integration design provided by no less then ten microcontrollers. At the heart of the board is a master microcontroller 141, preferably a Cygnal Integrated Product microcontroller, C8051F042. This device is a "Big-Brother" to the F310 device used on the stand-alone interface module. It incorporates the same 25 MIP 8051 central processing unit (CPU) with JTAG interface 142 as found on the F310. It also includes all the features and peripherals found on the F310 plus a large number of addition features. These include expanded onboard FLASH program memory (64K bytes total), expanded random access memory (RAM) (4352 bytes), a larger number of input/output port pins (64 total), a controller area network (CAN) protocol serial port, an additional PC compatible COMM port (UART), and an additional timer and an additional 8-bit analog to digital converter. The F042 also incorporates an external expansion bus, which allows further memory and peripheral expansion "off-chip."

Page 28, lines 21-25 through Page 29 lines 1-8,

In ~~Figures 6A-D~~ Figures 6A-1 through 6A-8, 6B-1 through 6B-8, 6C-1 through 6C-8, and 6D-1 through 6D-8, eight (8) additional slave microcontrollers or module slaves 149 are found on the interface module motherboard. Each is a Cygnal Integrated Products C8051F310, the same device used on the stand-alone interface module. Each interface module slave monitors two plug-in interface modules 150 in real-time. Each interface module slave communicates with the master via the SMBus. When an alarm condition on any one plug-in interface module is detected, the status is reported to the master. It should be noted that the circuitry is the same for all eight interface module slaves 154, 160.

In ~~Figure 7~~ Figures 7-1 through 7-4, a single buzzer 161 is provided on the interface module motherboard. It provides an audible warning of an alarm condition. Four external alarm outputs 165 are available on the interface module motherboard. Up to four external buzzers, bells, sirens or warning lights maybe remotely located with in the boundaries of an installation.

Page 29, lines 17-25 through Page 30, lines 1-7,

In ~~Figure 8~~ Figures 8-1 and 8-2, 24vac power is supplied to the interface module motherboard by a screw terminal 166. A full wave bridge rectifier 168 converts the 24vac to 24vdc. A relay circuit 169 is used by the master to switch the input voltage supply from the 24vac to 24vdc battery backup. Two voltage regulators, one 5vdc and the other 3.3vdc, form a power supply to power the circuitry found on the interface module motherboard. This includes power for 16 interface modules. The master monitors the power supply voltages 172 for normal operation. Voltages outside allowable tolerances generate an alarm condition.

In ~~Figure 9~~ Figures 9-1 and 9-2, the interface module motherboard provides 24vdc battery backup for the complete system. This is provided by two 12vdc sealed lead-acid 30 amp/hr batteries connected in series (24vdc). An onboard charger 174 maintains a charge on the batteries. The master microcontroller monitors and controls the operation of the charger. This includes monitoring the charge/discharge current 173, the battery voltage 172, and the current status of the charge cycle 176. The charger can be configured for a number of different battery configurations 177, 178.